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EFFECT OF FORESTS ON RUN-OFF

BY J. C. STEVENS.

(This article is the first of a series in which the effect of forests on run-off is thoroughly discussed. The author leads up to the conclusion that they do not exercise any appreciable influence upon stream flow and that where it does exist in slight degree it may in some cases be beneficial, and in others harmful. Mr. Stevens is a civil and consulting engineer, Portland, Oregon, and Apartado 491, Barcelona, Spain; a member of the Oregon Society of Engineers, and formerly District Engineer, U. S. Geological Survey, Portland, Oregon.—The Editors.)

The theory that forests on the watershed of a stream act as a substantial conserver of precipitation has been accepted by the great mass of people as an established fact. It is a plausible theory and has been so oft-repeated that those who have given the subject only casual thought or superficial study accept it without further question.

The truth of the matter is, however, that this theory is neither established nor admitted by many whose opinions on the subject we are obliged to respect. There is no evidence in the world today that will either absolutely establish or absolutely refute the theory. Because of this fact it is necessary, in order to reach a rational conclusion on the subject, to resort to inductive reasoning and then to draw whatever conclusions are warranted by such data as we have.

I shall first treat the subject of precipitation,

Water Conservation Above the Timber Line.

run-off, erosion, etc., and the relation of forests thereto in a general way. Next I shall present whatever data I have been able to gather on the subject.

Relation of Run-Off to Precipitation.

When water is precipitated in the form of rain, a portion of it runs from the surface directly into the water-courses of the region, and a second portion percolates into the soil and underlying rocks and appears lower down in the stream channels in the form of springs or seepage water. Those two portions together constitute the run-off from the water-shed. A third portion sinks too deep into the ground to

A Gradual Run-Off From the Melting Snows.

appear as run-off. A fourth portion is evaporated directly from the water surfaces, moist soil and wet vegetation on the area. A fifth portion is transpired by plant growth, i. e. given off as vapor from plant leaves and used in the body of the plant itself. A sixth portion remains stored in lakes or in the interstices of the soil and rocks comprising the area. If precipitated in the form of snow, the water is not disposed of in accordance with these several processes until melting occurs.

The water that falls on an area disappears by any or all of the six routes about outlined, and the proportion that disappears in each depends upon the conductivity of each route, so to speak.

The amount of run-off depends upon the following principal factors:

1. The porosity of soil and underlying strata. On this largely depends the division of water between surface flow and shallow percolation.

2. The intensity and nature of precipitation. Gentle showers for several days may produce very little run-off, while half the amount falling in a few hours would produce a flood. A snow fall, of course, produces no run-off until melting occurs; then the water disposes itself in virtually the same manner as if newly precipitated.

3. The condition of the ground prior to precipitation. If frozen or saturated, no infiltration is possible. A snowfall on frozen ground will all appear as run-off when it melts. If the ground was unfrozen, considerable water may percolate into it at the time of melting. Completely saturated ground acts in a similar manner with rainfall.

4. The topography of the area. Steep slopes permit rapid surface flow, while gentle slopes permit greater percolation other factors being equal.

5. Cultivation. This affects the porosity of the surface soil. Fallow fields are very receptive to percolation.

6. Vegetation. The roots and stems of grasses, brush, trees, etc., mechanically retard, to some extent, the flow of surface water and permit percolation. The principal effect of vegetation, however, is through the medium of evaporation and transpiration.

7. Evaporation and transpiration. The greater the evaporation the less the run-off, other things being equal. The greater the area of lake surface on a water-shed, the greater the amount of evaporation. Trees and plants evaporate enormous quantities of water as long as they are wet, and continue to transpire large quantities of water long after evaporation has virtually ceased.

There are others, but these are the principal factors and they are so related one with another that the effect of one cannot be isolated except under identical conditions regarding every other. The meagre data with which to solve problems in which these factors are involved, and the complexity of the problem, are at once apparent. The relation between precipitation and run-off has engaged the attention of engineers for years, yet up to the present time no satisfactory relation has been established between them. All that we can expect to show are general tendencies produced by certain factors. It is impossible to account for all the factors that enter into the problem. No two drainage areas are alike, hence each area is a law unto itself in this respect.

In arriving at any rational conclusions as to the effect of forests considered apart from all the other factors, no hard and fast rules can be laid down. The evidence gathered from experimental data and observation is so conflicting that only the more general conclusions can be utilized. Each region must be considered on its own merits, in the light of general knowledge adapted to its own peculiar conditions.

Many beneficial effects of forests are claimed that do not exist at all, and other claims are too intangible to admit of serious consideration. The following claims taken mainly from Bulletin No. 7, Department of Agriculture, Forestry Division, "Forest Influences," may be dismissed with the mere statement of them and the remark that if they exist at all they are not of sufficient magnitude to be of economic importance:

(a) Extremes of temperature of air as well as of soil are prevented.

(b) The average humidity of the air is increased.

(c) The disposition of precipitation throughout the year is favorably affected.

(d) By condensing dew, hoar-frost and ice on their branches, trees add to the precipitation.

(e) Forests keep the soil underneath granular and porous for the reception of water.

(f) Oxygen and ozone production by forests increase the purity of the air.

(g) Soil conditions of the forests are unfavorable to the production and existence of pathogenic microbes.

The claims that will seriously engage attention may be briefly summarized as follows:

1. Forests induce greater uniformity of stream flow than would obtain without them.
2. Forests prevent soil erosion.
3. Forests increase precipitation.

The small actual effects of these factors will next be discussed.

The agencies by which forests are said to increase the uniformity of stream flow are:

1. The bed of humus that develops under a forest cover retains a portion of the water that falls during wet periods and delivers it to the streams through the underlying soil in dry periods. Floods are diminished and low stages augumented by the amount of water thus retained.

2. Forest litter, roots, etc., mechanically retard the flow of water over the land surface and discourage the rapid rush of water into the streams. Soil erosion is thus prevented and flood heights diminished.

3. Forest shade retards the melting of snow in the spring and thus the period of run-off is prolonged.

Each of these generally accredited properties of forests will be considered first in general terms, then with such actual data as I have been able to gather on the subjects.

[To be continued.]

LIGHTING CRISTOBAL DOCKS.

An extensive system of lighting is being installed in the new docks at Cristobal. It provides for a total of three hundred and fifty 250-watt units inside and outside of the superstructure. These lights will be arranged in nine rows, spaced 30 ft. apart, seven rows extending the length of the dock structures on the inside, and one row along each side of the docks outside, and also across the ends. In addition, there will be a fixture on the outside corners of both buildings, consisting of a concrete bracket and reflector, similar to those employed in lighting the Canal locks. Each of the outside lights will be provided with a cast iron protector hood painted with two coats of lead paint and sanded, giving them the appearance of having been made out of concrete. It is estimated that about 26 miles of wire will be required for the electrical installation at both docks.

All the main cables are No. 4 insulated, lead-covered, and extend from the under-ground cable duct line in Cristobal to transformers in manholes near the docks. From the transformers, the cables are drawn into the buildings under the floors of the docks, terminating in a main panel situated in one corner of each dock structure. This panel is of slate, contains the usual switches and other operating apparatus. From this main panel, individual varnished cambric, lead-covered, No. 2, 3-conductor cables lead to eight smaller distributing panels in each dock structure, situated in the side walls, four to each side, spaced at about equal distances apart. These eight cables are carried in 2-inch galvanized iron ducts embedded in the roof concrete. From these points, the lights, in groups of four each, are supplied with current carried by No. 12 rubber-covered duplex wire enclosed in ½-inch galvanized iron conduit, embedded in the roof concrete. The units are composed of type S E E 250 reflectors, with 250-watt tungsten lamps.

THE RAILROAD COMMISSION AND THE PUBLIC.

BY JOHN S. EASTWOOD.

(The author reviews the public utility rate-making situation and affirms that the Railroad Commission of the State of California should fix the rates of all public utilities in the State of California, including those operating in municipalities.—The Editors.)

The railroad commission of the state of California should fix all the rates of all the public service companies in the state of California. It should be given full power to act as a court of arbitration between the public service companies and the public. It should be given the opportunity to assist the public service companies as well as to limit them, thereby benefitting the public as well, and it should perform the function of fixing the rates, for by so doing they can assist the public service companies by giving them the necessary financial stability, impossible under the present methods.

By having complete control of all the rate fixing as well as the regulating power it will be possible for the railroad commission to protect the public service companies from the public and the public from the public service companies. Each needs protection from the other. The stabilizing of the public service companies will benefit the public.

That each one of the above statements is true needs no demonstration.

The growth of public service is recent, has been rapid and is ever expanding and including new functions, and to its rapid growth can be laid most of the faults, real or imaginary, ascribed to public service companies by the public.

A hostility has grown up between the public service companies and the public due to their peculiar relationship, but mainly because of the more or less monopolistic character of the service, also because of the ability of the public service company to deprive the consumer of the service upon non-payment of bills.

Most people believe and insist that they are honest, and that they are sincere in this belief cannot be gainsaid, but too often they are influenced in their standard of honesty by their personal feelings, which are not a safe guide.

The account of the butcher, the baker and the candle-stick maker can be stood off, and they have no recourse when beaten out of their accounts, for many others are doing business in the same lines, but the public service company's service is one that can not be had elsewhere, conveniently, and this is the galling fact.

This condition compels a payment for a service that has been rendered at the date of presentation of the account. Too many people look upon this condition as an infringement on their rights, many look upon it as impugning their honesty. People hate to be forced to pay a bill.

Look the matter squarely in the face and you will know that this is at the bottom of any grievance, real or imaginary, you have against the public service company.

We are all alike, we want what we want when we want it, and what we want is certainly not to pay for a common place service that has been rendered, if we can help it, but to spend our money for joy.

We prefer to spend our money for the joys of life, not for the dead horse bills for necessities.

Our joys may be fine raiment, the bright lights, the music, the tinkle of glasses with a silver bucket on the side, or it may be gasoline and high speed with a highball now and then, or again it may even be sweet charity, or white ribbons and tea, but what ever our joys are, they are the things we delight to spend our money for.

It is often said that in this world there is nothing certain but death and taxes.

All people hate a tax. A tax must be paid or property will be taken for its satisfaction.

A public service is not a tax, but the conditions of our modern life make it come very near it.

Property can not be taken for the non-payment, the consumer has had the service, and is obliged to get along without it for what he has had unless he pays the public service company has an unpaid account, and both have a grouch.

It is therefore hopeless to think of an entire removal of hostility.

Some people think the only cure is public ownership.

Public ownership will shift the position of the difficulty, and possibly the distribution of the burden of payment but does not remove the difficulty.

The same conditions as to payment of bills must remain.

It is the last stage, and there is no recourse.

People who cry for it will then have not only to pay, but pay more for less efficient service.

None of the utopian dreams or rosy ideas work out in practice, principally because all incentive to good and economical service is removed as soon as it is in the hands of the municipal employes.

What is everybody's business is nobody's business.

There is no way to compel efficient municipal public service.

The functions are so many and needs of the municipalities so great, in addition to that of public service, that there is not, and can not be, property value enough in the municipalities to permit bonding them to acquire all the public service required by modern conditions.

That being the case there is no other way, than to have privately owned public service companies, for this service has become a necessity.

If they must remain in private ownership, they must furnish service to the public on a reasonable basis.

A reasonable basis is that there should be a fair return to the owners of the public service company for the service.

But the determination of what is a fair return is one of the biggest problems now before the public service commissions, whose duty it is to do the rate fixing.

It is a problem that is intricate and variable, and can only be solved by those having the facilities to determine, and integrate all the factors that enter into it.

The rate fixing should be in the hands of the state railroad commission, for it alone is in a position to get the necessary data upon which to arrive at a fair basis for rate fixing.

The rate fixing should be in the hands of the state railroad commission, for it alone has the service of experts to solve the problem of the fair basis of the rate fixing.

The rate fixing should be in the hands of the state railroad commission because it alone is capable of doing so in strict justice as between the public service companies and the public.

The railroad commission should not be hampered in the performance of this enormous task by being compelled to hire any but the very highest grade expert talent, for such service to the public is cheap at any price.

The last person in the world that should have the rate fixing power is the councilman of a municipal corporation, because he is in every way unfitted and disqualified for this work.

He can not do it in fairness to himself, the public or the public service company.

He has not the knowledge, the time, or the ability to acquire the knowledge to enable him to take up the matter of the solution of the problem of the fair rate fixing basis.

He is under political obligations to the voters of his ward, and there is a definite, or implied promise on his part to reduce rates in return for his election.

He is himself a consumer of public service and has his own natural inclinations to resist, when he is a fair-minded person.

When he is not a fair and honorable citizen, and such cases have been known, it is impossible to tell where he will stand.

There can be no more unfair condition imagined than to expect a fair adjustment of public service rates from a man who has absolutely no element in his relationship to the public service company, other than that to lead him to cut the rates down.

The question always is, "how much are the rates to be cut down?" And not "how are the rates to be adjusted?"

The councilman is handicapped by public suspicion of graft if he is fair to the public service company, or is blamed by the citizens for not doing his duty to his constituents who elected him, if he does not cut the rates down.

The rates for public service have been thus forced down in price at about the same rate that other necessities of life have gone up.

A decrease in rates can not continue indefinitely, for sooner or later it will reach the zero point.

During the period in which the public service has been developed, it has been steadily forced down in price, while labor and the cost of living and most all materials have steadily gone up.

It stands to reason that with two things moving in the opposite directions, the one down the other up, the apparent speed of their departure from each other is rapid, and it takes but a short time for them to reach the extremes of separation.

The public service companies have been bled till they are anaemic.

They have been starved till they are unable to

make the necessary improvement, except at ruinous financial sacrifices, which weaken them still further.

They have been cut to the quick until the very nerve centers are laid bare.

They are in the condition of the farmer's horse that was being trained to live on a straw less every day—their bones are emerging.

The public service has become the big end of business, and it stands to reason if the big end of the business is sick, the remainder of the business body can not long remain well.

That is what is increasing the army of unemployed.

Samson destroyed himself as well as his enemies when he pulled down the pillars of the temple.

The public service companies are suffering from a lack of confidence on the part of the investing public in their safety and stability.

It is an often heard complaint that they are over capitalized and that stock is watered.

This is partly true in some cases, but is largely due to laws made to harrass rather than to help corporations.

All the pioneers in public service know to their sorrow that when a demand had first to be created for the service, all the so-called securities were liquid, and a buyer of bonds was not an investor, but a bold speculator.

If the tide took him in, he was successful, if it took him out he was a wreck.

Corporations were and are obliged to lay a large foundation to meet the conditions of growth, and are obliged to make their provisions in the start of the business for future growth, due to the cumbersome corporation laws, that make enlargement so difficult.

There has been forced on them the combination of small corporations, that were organized to meet the small demands for service in the beginning, and these companies must be kept alive and fully organized until the last of their obligations have been met.

Thus the holding company, interlocking directorates and affiliated companies, under the corporation laws, become a necessity.

It has been made more and more onerous and difficult to incorporate companies and to transact corporate business, the idea being to harrass and discourage rather than aid corporate investment.

All of these things have made it more difficult to finance these concerns, necessitating stock bonuses, but none of the obstacles of law are so potent as the fear on the part of the investing public that they will be ground to powder between the upper and the nether millstones of commission regulation and municipal rate fixing.

This condition of financial instability may not seem to be of much interest to the consumer of public service, but in the end the consumer will pay for the ruinous sacrifices the public service company has had to make in order to deliver the service.

With the settled condition that would be brought about by the complete regulation of policies and income by a just tribunal, the finances of the companies should be so vastly improved that it would be possible to sell their securities at or near par in the open market, for they would then be sought as a safe investment, rather than as a speculation, the contract for works could be let to the lowest responsible bidder, and the company and the public through it would have the full value of the economy in cost in the reduced cost of the service.

The condition of the public service company may be justly compared with that of a snake trying to crawl through a hole under a high wall, the public service commission punching it on the tail to speed it up, the public on the other side beating its head off.

To give good service, the public service company must be properly sustained, it can not be expected to furnish the best service at the best economy under the strain of fear of annihilation of the values of its securities.

And under the present conditions this fear is ever present for there are so many people that would like to use the machinery of municipal competition to wreck the privately owned public service company.

This effort is now being made in the two largest municipalities in the state and many of the best citizens have their sense of honor so eclipsed by petty spite, that they think it a square deal.

This desire on the part of the people to get the public service in some lines into the ownership of the municipality is due on the part of many who know they will have to pay more for poorer service, to their antipathy to the public service company.

It is due on the part of many more, who honestly believe on account of representations made to them that there will be a lower rate and better service, even though they know the investment and operating expense will be higher.

It is a hope that some way, some one else will have to carry their burdens.

All the experiments thus far made with the municipal ownership have proven that municipal public service costs more to somebody than privately owned public service.

The reason that in some cases it appears to be cheaper is because of the method of distribution of costs by the bookkeeping methods employed. The burden is not so fairly distributed, as the tax deficit must be borne by the property owner, who may not even be a consumer of public service.

Competition in public service between a municipal and a privately owned public service company is unfair and expensive, both to the public service company and the municipality.

It should be made possible by a law giving such power to the railroad commission as to prevent competition between a municipality and a privately owned public service company.

At least such municipal public service as is in competition with privately owned public service in the same line should be regulated by the railroad commission.

Another phase of the situation to which the above leads, and that is that competition between regulated privately owned public service companies is not only unnecessary, but is wasteful.

Though the Federal government, through the Sherman law, is trying to create a condition of artificial competition by the trust busting methods, its acts so far have not been shown in any increase of

efficiency or decrease in cost of the products of the busted trusts.

It would be far wiser were a law enacted by the congress to begin at the seat of the trouble and regulate the trusts as to their financial stability and the price of their products to the public, and thereby make the present big business securities a safe investment for the many, rather than to try to scatter the evil, only to add to the cost of their administration and reduce their ultimate efficiency.

The need of competition between the public service companies in the same market is entirely removed where the finances, the rates and the quality of service are all regulated by a public service commission.

It should be the policy of the public and of the public service commissions to encourage combination in the same natural field, for this all tends towards, and leads to, a reduction of the cost of the public service, both by the reduction of the overhead costs, and also by the removal of unnecessary duplication of plant.

Competition and duplication in telephone service particularly is not only utter folly under regulation, it is a crime against the common people. The removal of competition should also add to the element of financial security and lead to the economy of extension of service, that can be had only with financial stability.

A sane state regulation removes any excuse for the foolish, impractical and drastic regulations imposed on the development of water power in the forest reserves by the officials of the Federal government.

The people of the states where the public utilities are commission regulated are only hampered by these Federal regulations, and the Federal regulations of water power development should be discontinued in all such states.

These regulations are intended to cover the same jurisdiction as that of the public service commission, but they are unsettling of the financial standing, owing to the revoking clause, and are based on the federal policy of preventing combination, which is also bad.

The people of the state should not be obliged to pay the Federal government for the use of its own water, for this is what the forest service charges amount to.

No water power is worth anything to anyone not connected with an existing power company, for the reason that it is the policy of the railroad commission to prevent competition except as a matter of public convenience and necessity.

This policy is not only right as tending to stabilize the existing companies, but it is to the interest of the public as well.

There will be no new water power development in California for general distribution, except by some one or other of the existing companies, and there should not be.

As time goes on, more and more of the necessities and comforts of life that are subject to general distribution will come under the head of public service, for there is a constant accretion of inventions that at first are luxuries and finally become by use necessities, and their general distribution make them public service.

The rates as well as the finances of the public service companies should be regulated by the railroad commission, because it is the only fair tribunal capable of coming to a just decision as to the relations of the public service companies to the public and the public to the public service companies; because it is the only way that confidence can be restored in the public service securities, and stability given to the investment; because this stability inures to the benefit of the consumer who will thereby receive the maximum of service at the minimum cost; and because the public needs protection from the exactions of the public service companies, and the public service companies need to be protected from the avarice of the public.

CENSUS FIGURES ON ELECTRIC LIGHT AND POWER.

Preliminary figures of the forthcoming quinquennial report on the central electric light and power stations of the state of Idaho have been given out by Director W. J. Harris of the Bureau of Census, Department of Commerce. The figures presented for Idaho show that during the decade 1902-1912 there were substantial gains in the industry. The number of establishments increased from 19 to 38, of which 35 were commercial and 3 municipal; the increase in income was 725.9 per cent, from $192,206 to $1,587,407, and the increase in expenses was 989 per cent, from $141,160 to $1,537,260. The number of persons employed in the industry was 324 in 1912 as compared with 88 in 1902. There was an increase in the total horsepower employed from 5454 in 1902 to 56,375 in 1912, of which 4525 horsepower was generated by 14 steam and gas engines (including turbines) and 51,850 horsepower by 63 water wheels. The kilowatt-hour output of stations increased from 5,018,149 in 1902 to 115,812,292 in 1912.

The arc-light service was 557 in 1902, compared with 1,349 in 1912, an increase of 142.2 per cent, while the increase of "all other varieties" of lighting service was 685 per cent, from 33,262 lights in 1902 to 261,096 in 1912. The number of stationary motors served increased from 163 in 1902, with a horsepower capacity of 205, to 1773 in 1912, of 27,142 horsepower.

Idaho.

	1912.	1907.	1902.	Per cent of increase [1] 1902-1912.
Number of establishments	38	42	19	100.00
Commercial	35	40	18	94.4
Municipal	3	2	1	200.0
Income	$1,587,407	$719,395	$192,206	725.9
Light, heat & power	$1,551,549	$692,489	$191,126	711.8
All other sources	$35,858	$26,906	$1,080	.....
Total expenses, including salaries and wages	$1,537,260	$472,493	$141,160	989.0
Total number of persons employed	324	188	88	268.2
Total horsepower	56,375	13,694	5,454	933.6
Steam and gas engines (including turbines):				
Number	14	19	15	—6.7
Horsepower	4,525	2,202	1,530	195.8
Water wheels:				
Number	63	37	23	173.9
Horsepower	51,850	11,492	3,924	.....
Kilowatt capacity of dynamos	35,656	7,082	2,774	.....
Output of stations, kilowatt-hours	115,812,292	9,577,588	5,018,149	.....
Estimated number of lamps wired for service:				
Arc	1,349	[2] 966	557	142.2
All other varieties	261,096	[2] 122,491	33,262	685.0
Stationary motors served:				
Number	1,723	406	163	957.0
Horsepower capacity	27,142	4,054	205	.....

[1] A minus sign (—) denotes decrease.

[2] Exclusive of 11 arc and 1168 lamps of other varieties reported by the electric companies as used to light their own properties. Lamps used for such service were included in the number reported for 1912.

LIGHTING METHODS

METHOD IN HOME LIGHTING.

Introduction.

Home lighting improperly installed may prove a perpetual annoyance. Because overly brilliant it may unduly animate at those times when the opposite effect is desired; discomfiture results from its incompleteness; and high lighting bills are the monthly reminder of its inefficiency.

But by the use of proper methods, home lighting may be made artistic, harmonious and restful, and so contribute to home comfort and happiness. Effectiveness may be had with economy.

"Cheap Types Which Tire and Promote Ocular Discomfort."

Usually the purchaser of a small "ready-to-wear" house or bungalow is fortunate if the owner has deferred installing the lighting fixtures until chosen by the purchaser. He is unfortunate when a speculation builder with an eye to "how cheap," installs a lighting system at once unsightly, unsatisfactory and unsuited to the new home which, although otherwise pretty and complete, may in this way be marred. Familiarity with these cheap types which tire breeds disgust; they are usually unscientific also and cause ocular discomfort. The lighting fixtures add the finishing touch to the home and should be tasteful.

On the other hand, there is the artistic builder who realizes that it is unwise to "spoil the ship for a ha'porth of tar," and who therefore provides a complete lighting installation which harmonizes with the interior and the decorations. Such builders, and their number is increasing, do not set aside a small—a very small—percentage of the total cost of the building and say "thus far and no farther," but decide on the amount to be expended in this way only after careful consultation with a well-informed and well-intentioned fixture dealer. One who may be relied upon to confirm the choice only of those fixtures which will give satisfactory lighting results in addition to their artistic and harmonizing influence.

Method in home lighting goes still further back for it involves careful planning of the wiring system as well.

Builders who build to sell the house and not the purchaser, are careful to insist upon proper and complete planning of the wiring and switching arrangements as well as in the selection of fixtures. A proper lighting installation will often effect the sale. These builders recognizing the monetary value of method in home lighting look to their architects, sub-contractors or fixture dealers to provide that which will prove most satisfactory.

They who build their own homes should give this question considerable thought that a successful installation be assured. What follows covers this last situation, but is applicable, in degree, to the others also.

The Wiring Plan.

It is a good idea to mark the proposed outlets—those points at which switches, lighting fixtures, baseboard receptacles, telephones, etc., will later be installed—on the floor plan. It is much easier to alter locations on paper than it is to pay for "extras" for changing them after installation, and incidentally cheaper. Further it enables the wiring contractor to more carefully estimate the cost of the job, and if accompanied by a specification, ensures the installation exactly as you have provided.

To avoid confusion and to facilitate the work of contractors, symbols should be used for these markings which will be readily understood by those who have to interpret them, and the use of those which are standard is strongly urged.

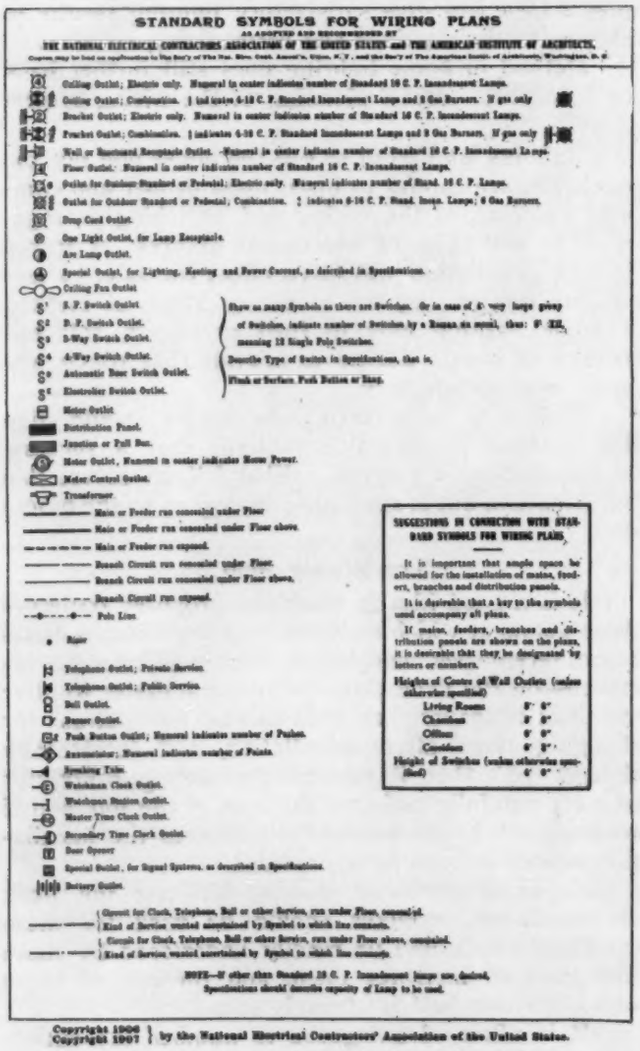
It is often advantageous to number the outlets for cross reference with the specifications.

Specifications.

It is the duty of the one who plans the installation to protect both parties from loss, and fundamentally a specification should therefore be to protect; to show what is desired done and to ensure its being accomplished at the pre-arranged contract price. It should form a part of the contract which should also invariably be made. This too, will tend to reduce "extras."

A word of warning against acceptance of the offer of those who say that they will do the job complete for a certain amount without a contract and thus save the preparation cost of plans and specifications. Their estimates are often remarkably low, and if you have commenced inquiries you will begin to wonder why it is that they can do it so cheaply. The reason is that they expect to trade on the customers inexperience. Their estimates are not inclu-

sive—there is always something you expect to get which they did not figure on supplying—and in this way they make their profit from "extras." The first estimate is usually lower, but the ultimate cost generally much higher than it would have been had the contract been made with a responsible firm—not to mention the difference in workmanship and quality of


STANDARD SYMBOLS FOR WIRING PLANS

AS ADOPTED AND RECOMMENDED BY

THE NATIONAL ELECTRICAL CONTRACTORS ASSOCIATION OF THE UNITED STATES and THE AMERICAN INSTITUTE OF ARCHITECTS.

Ceiling Outlet; Electric only. Numeral in center indicates number of Standard 16 C. P. Incandescent Lamps.

Ceiling Outlet; Combination. } indicate 4-16 C. P. Standard Incandescent Lamps and 2 Gas Burners. If gas only

Bracket Outlet; Electric only. Numeral in center indicates number of Standard 16 C. P. Incandescent Lamps.

Bracket Outlet; Combination. } indicate 4-16 C. P. Standard Incandescent Lamps and 2 Gas Burners. If gas only

Wall or Baseboard Receptacle Outlet. Numeral in center indicates number of Standard 16 C. P. Incandescent Lamps.

Floor Outlet. Numeral in center indicates number of Standard 16 C. P. Incandescent Lamps.

Outlet for Outdoor Standard or Pedestal; Electric only. Numeral indicates number of Stand. 16 C. P. Lamps.

Outlet for Outdoor Standard or Pedestal; Combination. ‡ indicates 6-16 C. P. Stand. Incan. Lamps, 6 Gas Burners.

Drop Cord Outlet.

Gas Light Outlet, for Lamp Receptacle.

Arc Lamp Outlet.

Special Outlet, for Lighting, Heating and Power Current, as described in Specifications.

Ceiling Fan Outlet

S¹ S. P. Switch Outlet
S² D. P. Switch Outlet.
S³ 3-Way Switch Outlet.
S⁴ 4-Way Switch Outlet.
Sᵃ Automatic Door Switch Outlet.
Sᶜ Electrolier Switch Outlet.

Show as many Symbols as there are Switches. Or in case of a very large group of Switches, indicate number of Switches by a Roman as numeral, thus: S² XII, meaning 12 Single Pole Switches.

Describe Type of Switch in Specifications, that is, Flush or Surface, Push Button or Snap.

Meter Outlet.

Distribution Panel.

Junction or Pull Box.

Motor Outlet, Numeral in center indicates Horse Power.

Motor Control Outlet.

Transformer

Main or Feeder run concealed under Floor

Main or Feeder run concealed under Floor above.

Main or Feeder run exposed.

Branch Circuit run concealed under Floor.

Branch Circuit run concealed under Floor above.

Branch Circuit run exposed.

Pole Line

Riser

Telephone Outlet; Private Service.

Telephone Outlet; Public Service.

Bell Outlet.

Buzzer Outlet.

Push Button Outlet; Numeral indicates number of Pushes.

Annunciator; Numeral indicates number of Points.

Speaking Tube.

Watchman Clock Outlet.

Watchman Station Outlet.

Master Time Clock Outlet.

Secondary Time Clock Outlet.

Door Opener

Special Outlet, for Signal Systems, as described in Specifications.

Battery Outlet.

Circuit for Clock, Telephone, Bell or other Service, run under Floor, concealed.
Kind of Service wanted ascertained by Symbol to which line connects.

Circuit for Clock, Telephone, Bell or other Service, run under Floor above, concealed.
Kind of Service wanted ascertained by Symbol to which line connects.

NOTE—If other than Standard 16 C. P. Incandescent lamps are desired, Specifications should describe capacity of Lamp to be used.

SUGGESTIONS IN CONNECTION WITH STANDARD SYMBOLS FOR WIRING PLANS.

It is important that ample space be allowed for the installation of mains, feeders, branches and distribution panels.

It is desirable that a key to the symbols used accompany all plans.

If mains, feeders, branches and distribution panels are shown on the plans, it is desirable that they be designated by letters or numbers.

Heights of Centers of Wall Outlets (unless otherwise specified)

Living Room	8' 0"
Chamber	8' 0"
Office	8' 0"
Corridor	8' 0"

Height of Switches (unless otherwise specified) 4' 0"

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Copyright 1907 }

"Symbols Which Will Be Readily Understood."

materials. This of course does not apply to those cases where the fixtures only have to be installed and the customer visits a fixture dealer to make the selection.

Fire Hazard.

Workmanship and quality of materials are of great importance in connection with electric light installations not only because it is desirable that the completed installation please the eye, and be more or less permanent, but it must also be so installed that the "fire hazard" is reduced to a minimum. This fire hazard is mythical when the installation is made according to "Code," but the cheap job is usually skimped in the hope that a careless inspector will permit the poor workmanship and material to pass. It is therefore advisable to require a Fire Underwriters' certificate of inspection in addition to that of the municipal electrical department certificate.

The National Electric Code.

The "Code" referred to is a very complete set of rules issued by the Board of Fire Underwriters and is the outcome and growth of years of experience in providing rules which properly followed will result in maximum safety—reduction of the fire risk to a minimum. These rules are recognized throughout the nation.

It is therefore usual to include in the specifications a provision to the effect that all work must be done in accordance with these rules. This, however, will be taken up in more detail later.

Limitations.

Although this subject has so far been discussed in a general manner, and in regard to matters applicable to all installations it is nevertheless impossible to do this as we get down to cases.

It is the intention to eventually conclude this article with the light and illumination plans and specifications of a small home, but before doing this it is advisable to still devote some space to the manner in which each room and the exterior house and and grounds of homes in general, might be equipped. This will be taken up in the following order:

(1) The Entrance Gate, etc.
(2) Outside Decorative Lighting.
(3) Veranda and Porch.
(4) Entrance Hall.
(5) Living Room.
(6) Dining Room.
(7) Den.
(8) Kitchen, Pantry and Cellar.
(9) Bedrooms, Bathroom and Boudoir.
(10) Servants' Bedroom.

There is also the much mooted question of direct, semi-indirect, or indirect lighting. As there are differences of opinion as to what constitutes the "best" so in what follows it must be understood that individual views are presented. These are based, however, upon wide experience and with due regard to efficiency and effectiveness, and the limitations of each system both as regards economy and application, although each system represents good lighting practice under certain conditions.

[To be continued.]

LETTER TO THE EDITOR.

Cleveland, Ohio, January 8, 1914.

Gentlemen:—I have just noted in your January 3d issue the first appearance of your new department on "Lighting Methods." I feel that you are to be congratulated on this new departure as there is unquestionably a distinct field of usefulness for your magazine in illumination and lighting matters generally on the coast.

I trust that much new and valuable material will appear in your successive issues and shall look forward to each number with interest.

Wishing you every success in this new venture, I am,

Very truly yours,

E. B. ROWE,

Chief Illuminating Engineer, Holophane Works of General Electric Company.

HYDRAULICS.

BY OTTO B. GOLDMAN.

(In this installment of his series on Hydraulics the author presents a basis for rate-making upon the cost of service, which would result in more equitable rates and a more uniform loading of the power plant. The author invites discussion and criticism of his views.—The Editors.)

VI—Power Rates.

For power rates to be equitable, they must be based upon and directly proportioned to the cost of rendering the required service, and this ratio of rate to cost of service must be a constant for all classes of service. The service to be rendered by a power company to its customers varies greatly, not only with the class of service but with the time of the day and year.

At the present time Public Service Commissions are expending a great deal of energy and time upon obtaining an equitable rate for power and light service furnished to the general public.

The National Electric Light Association has employed men to make extensive and theoretical analysis in order to substantiate the rates promulgated by the Public Utility Corporations themselves, who are members of that association.

Articles such as "The Graphic Representation of Electrical Rates," by H. E. Eisenmenger, published in the "Journal of Electricity, Power and Gas," July 20, 1912, is a specific attempt at a theoretical exposition of a rate.

Feeling that past endeavors have only resulted in specific application of theoretical treatises on this subject and that these were based upon arbitrary assumption, not in accordance with the physical conditions involved, the following article has been submitted.

In practical application the past endeavors seem to lead to establishing rates which force the small customer to bear the heaviest burden.

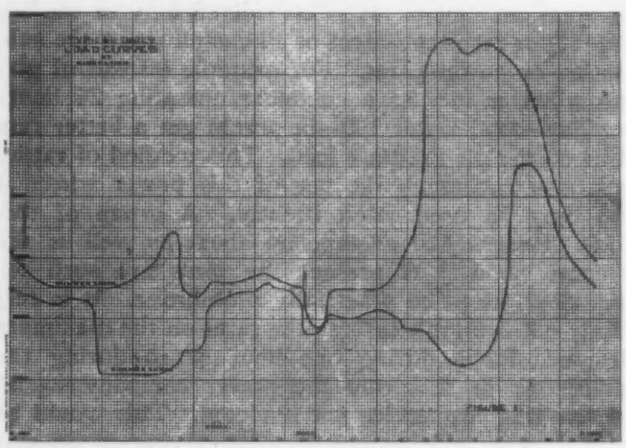

Fig. 1.

It is not a far cry and we are rapidly approaching the date when it will be necessary for our Public Utility Commissions to establish a theoretical, practical, universal and equitable method on which to base all lighting and power rates, and not accept and endorse public utility corporations' own self-devised and defensive systems of obtaining these rates as submitted to them. The same may be said of rates for gas.

Fig. 1 represents a typical 24-hour load curve, taken at the substation, and therefore representing the aggregate of all classes of service on the line. The upper curve was taken in the winter, and the lower in the summer.

Fig. 2 illustrates the difference in service required by different classes of customers. A and B are strictly lighting loads, of residences and apartments, having two pronounced peaks, a minor one in the morning between 7 and 9 a. m., and a major one between 5 and 11 p. m., with practically no intermediate load. The business load shows a good day load with a very heavy peak load coming on rather earlier than the residence peak, while the mill and factory load is essentially a day load, falling off well before the heavy evening peak lighting load.

The size of plant required by loads A, B and C would be about 250 amp., while that for all four would be only 316 amp.

To make matters more intricate we have the seasonal load variations, as shown in Fig. 3. This is based on kilowatt-hours consumed per month. It shows that, from April to and including August our kw.-hr. consumption is comparatively low.

At present but little is done toward giving the individual consumer a rate based upon the cost of rendering the particular class of service he demands. The rates are essentially alike for all classes of service. For example, he is assessed the same maximum demand charge whether his load comes on during the day when our load is light or on our peak load. The rates at present are based upon a maximum demand charge plus a rate per kilowatt-hours plus a constant, or on a "sliding scale" as illustrated in Fig. 4, used by the city of Seattle. In the first place decreasing the rate with increased size of unit other conditions being equal, is analogous to giving a better rate to a man shipping a thousand carloads of freight per year than to one shipping but ten. Such a practice is entirely indefensible if the power company is viewed as a public agency as laid out by Commissioner Thelen of California.

In taking up the matter of maximum demand charge, we will again refer to Fig. 1. Except between 4:30 and 11 p. m., this shows a maximum winter load of 3400 kw. Were it not for the period above referred to, this size of equipment would be ample. But for that period we need a 6600 kw. plant. Similarly during the summer, between 8 and 12 p. m. we need a 4600 kw. plant and for the remainder of the day a 2600 kw. plant would do.

Taking up the matter of fixed charges, in view of the foregoing it would be eminently unfair to assess this class of charges against the customers during any one moment except in proportion to the size of plant required by the aggregate of customers during this unit of time. We may therefore lay it down as a general rule, that the fixed charge component of the rate per kilowatt per hour during any one hour of the 24, is the fixed charge corresponding to a plant of the size required during that hour, divided by the number of hours during the year in this hour that the plant is used, and divided by the total kilowatts during this hour, per power component. Thus if p_a kw. are coming on during an hour when the substation load is used continuously during the year, p_1 kw. are used

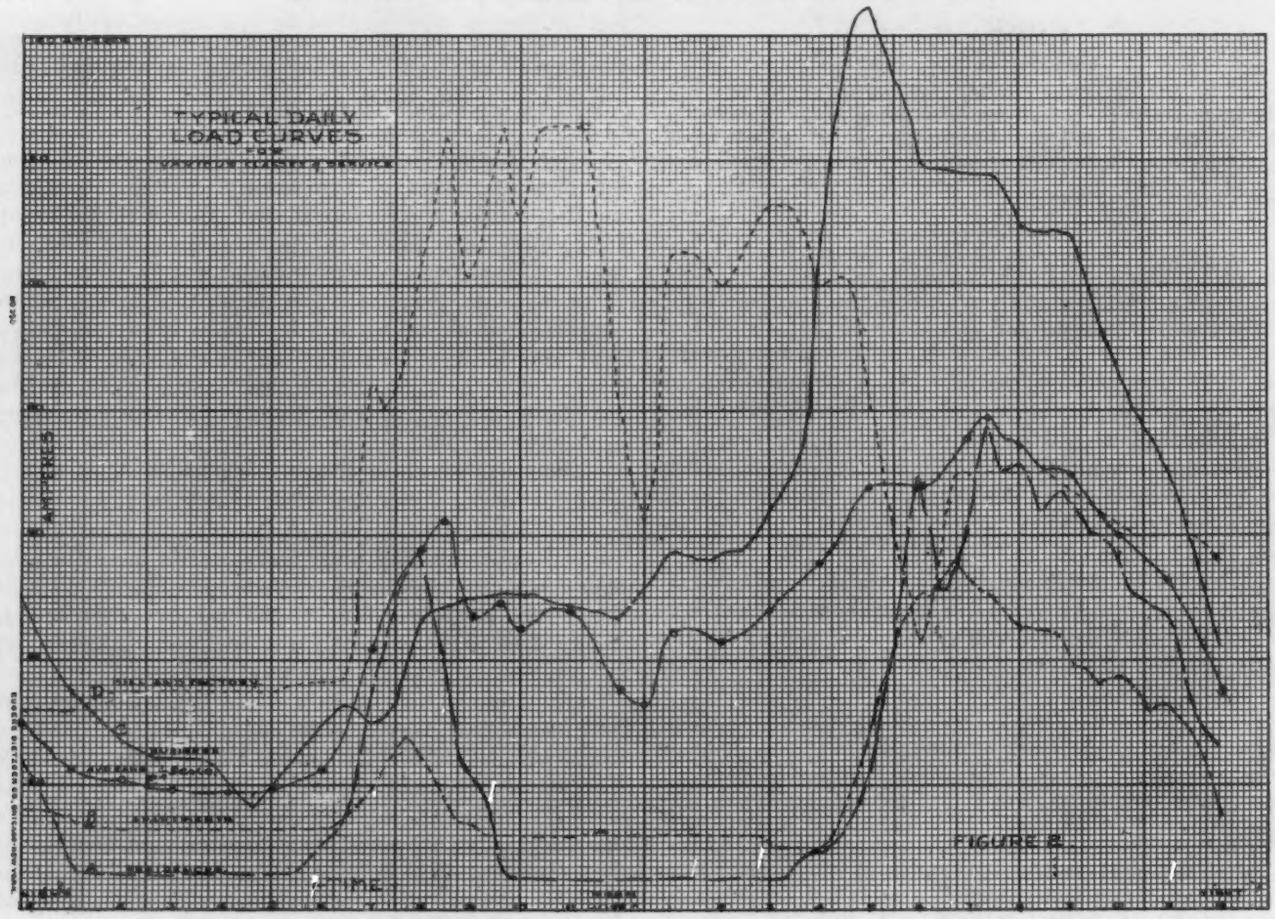

Fig. 2.

n_1 hours per year, p_2 are used n_2 hours per year, etc., and if s_0, s_1, s_2, etc., are the corresponding fixed charges, then if a customer has a load of k kilowatts the fixed charge component of his rate would be

$$R_f = \left(\frac{S_0}{365 \times 24 \times p_0} + \frac{S_1}{n_1 p_1} + \frac{S_2}{n_2 p_2} + \frac{S_m}{n_m p_m}\right) k P_m$$

kw. where $P_m = p_0 + p_1 + p_2 + \ldots\ldots\ldots + p_m$.

The part in the parenthesis is our fixed charge component of the rate per kw. during that hour. In present rates this component of the rate is simply

$$R_f' = E\left(\frac{S}{365 \times 24 \times P}\right)$$ per kw. of maximum demand

when P is the aggregate maximum demand during the year, and S the corresponding fixed charge. E is the "sliding scale" factor by which the heaviest burden is placed on the small users.

It is evident from the above, that the present rates, where otherwise justifiable in the aggregate, makes the lighting rate considered as a whole too low, while the power rate is too high. So also is the summer rate, as a rule, too high as compared with winter rates. As compared with that, the fixed component of the rate as we have laid out above, is simply the actual cost per kw. with allowable interest on the investment, during any unit of time, and therefore takes into consideration the class of service the power company is called upon to serve. It will encourage better loading of the power plant as much as physically possible, because it will be to the customers' interest to do so.

You will note that we find no need for the pretty but misleading term "load factor" as applied to individual customers. It is considered only in the aggregate or resultant effect of all customers at the substation or power plant. For example instead of giving a better rate to a customer operating 24 hours per day—load factor 100—he would get a better rate if he stayed off the peak load. This method of rating will also encourage the use of this power where it can only be used intermittently. A group of this class of users will average up about as well as the average plant. At present the rates are such for this class, as to be practically prohibitive. It is certainly not equitable to base the rates on the maximum demand shown during one hour or so during the month, as in this way the power company would be charging for service not rendered. This would be analogous to a labor organization saying to an employer that he will have to pay continuous wages on the basis of his maximum demand during, say, one day in the month or year on whatever theory they may wish to base this charge.

We thus see that the fixed charge is apportioned to the kilowatts consumed during any given hour, multiplied by the fixed charge component of the rate during that hour, or the fixed charge per kilowatt for any given hour is the fixed charge component of the rate. A similar analysis will give a similar result for the operating component of the rate. Be-

sides this each customer would have to pay a fixed charge per month for meter rent, transformer rent, if furnished, and the cost of meter reading, billing, etc., and also an initial fixed guaranteed repayment charge for any special material and labor furnished specially to connect up the individual customer and not commonly usable for other customers. This repayment charge could be made to extend over a greater or less

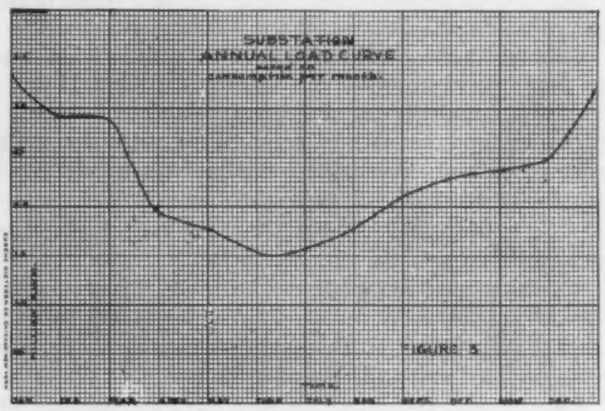

Fig. 3.

period to suit, but once completed, neither the customer nor the public generally should be chargeable with interest on this investment. It may be objected that the determination of the power used with reference to the time and the rating accordingly would be difficult and expensive. But after careful analysis of this subject, the writer came to the conclusion that a comparatively inexpensive meter could be devised to do both at once.

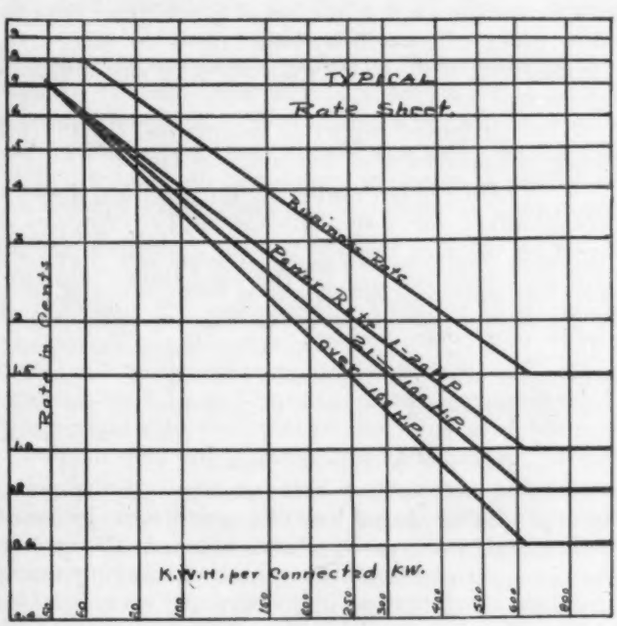

Fig. 4.

The power company is entitled to a fair profit on their investment, but are not entitled to charge for the power per se, as this is a public resource, unless the public, i.e., the government makes a charge on the power company, in which case they would be entitled to pass the charges on, to their customers. Again, as shown by Commissioner Thelen, the company is entitled to a return on a judicious investment only. The per cent of profit a company is entitled to should vary therefore, with the degree of skill and judgment shown in their investment and management. For example, referring to Figs. 1 and 3, if the generating plant consisted of a single unit, the average efficiency during the year would hardly exceed 40 per cent; if it consisted of two equal units, the efficiency would be about 55 per cent, while if this plant consisted of a 1200 kw., a 2600 kw. and a 2000 kw. unit, the efficiency would be made nearly 70 per cent with proper operation. Certain plant costs vary inversely with the obtainable efficiency, and therefore a good and skillful investment should be encouraged and entitled to better returns than a poorer one.

The above outlined system of rating is simply a method of properly apportioning the charges to the costs taking into consideration the different classes of service to be rendered. It would tend to load the power plant as nearly uniformly as physically possible. It will increase the power load, because of reduced rates during the day, especially during the summer, and by making the intermittent use of power possible. Especially now that the railroad and public utilities commission are taking up this subject, it is desirable that an equitable basis for power rating be found, instead of a temporary makeshift, so that these commissions will not one day find themselves in an untenable position.

The cracking of reinforced concrete due to electric current has resulted in numerous theories being advanced by way of explanation. That one which attributes it to oxidation of the iron anode has been fully established. The oxides formed occupy 2.2 times as great a volume as the original iron, and the pressure resulting from this increase in volume causes the concrete to crack open.

Partial electrification of the Rocky Mountain Division of the Chicago, Milwaukee & Puget Sound Railroad has been definitely decided by the management. The Deer Lodge-Three Forks section, to be first electrified, contains 113 miles of main line, or the equivalent of 168 miles of single track including sidings and yard tracks. Overhead trolley, suspended from mast arms on wooden poles, will be used on tangent track and span-wire construction on wooden poles over curves. This type of construction will be changed to steel poles and overhead bridge trolley construction in yards containing four tracks or more. It also has been definitely decided that the transmission voltage will be 100,000 volts a.c., feeding five substations ranging in capacity from 3000 kw. to 4500 kw., depending on their relative location to heavy grades. The operating current will be 2400 volt d.c. Essentially, the entire electrification, including the rolling stock, will conform to that installed by the Butte, Anaconda & Pacific Railroad. C. A. Goodnow, assistant to the president Chicago, Milwaukee & St. Paul Railway, authorizes the statement that no contract for the equipment has been let.

EVALUATION AND TRANSPORTATION SERVICE OF THE LOS ANGELES RAILWAY CORPORATION.

On the 23d of January, 1912, the City of Los Angeles passed "An Ordinance regulating the fixing of rates or compensation to be charged and collected by any person, firm or corporation for the conveyance of passengers for hire by means of street railway or interurban railway cars within the limits of the City of Los Angeles," and on July 1, 1912, the finance committee appropriated $15,000 for the purpose of making an inventory of street railways and an accounting of their records in order to determine what the rates should be. The inventory has now been completed and a condensed report of the findings of the Board of Public Utilities has been published.

It includes only the system and service of the Los Angeles Railway Corporation, no investigation having been undertaken of the Angels Flight Railroad, the Court Flight, or the Mt. Washington Railway.

The work was in general charge of consulting engineer, George A. Damon, Dean of Engineering, Throop College of Technology, and associated with Bion J. Arnold, of Chicago. A large part of the evaluation work has been carried on by the engineering staff of the Board of Public Utilities under the direction of C. K. Mohler, chief engineer of the railway department.

In one portion of his letter transmitting the report to the city council, president of the board, Augustine W. Wright states:

"Under the state law the amount of the bonded indebtedness must not exceed the par value of the capital stock for which subscription has actually been made, or conversely, the stock issue must be at least equal in amount to the bonds carried. There has already been issued $20,000,000 of Los Angeles Railway Corporation and $5,000,000 of City Railway stock certificates, which are not represented by a dollar's worth of actual physical property, and which are dependent on surplus earnings in order to create a market value. There is nothing criminal in the situation, as this procedure has always been recognized practice, not only allowable, but actually required by our state laws.

"Now, what should be done? We believe our first duty is to get control of the surplus. Any surplus earnings over and above a fair return should be available for more cars and better service; necessary extensions; renewals of equipment; the reduction of fares; or for depreciation as directed by the proper public officials.

"The 'extra profit' which is now thought to be 'fair' on account of the risk involved in the business should be reduced or entirely removed in the future by removing the hazard. It must be recognized that if the return upon the capital and upon the enterprise of the company is to be limited then the actual investment must be made secure.

"By taking all the chances ourselves, we can see no reason why the people should not be be able to turn the 'profit' which they now pay for 'hazard' and 'enterprise' into an amortization fund and thus provide for the purchase of the system out of earnings as one alternative, in case the city wishes to undertake municipal ownership.

"We have not undertaken to determine the relative merits or demerits of the municipality acquiring the property in this way, as compared to the issuing of revenue producing municipal bonds, or other possible means.

"The facts seem to justify the conclusion that in making such a contract the city could secure not only the right to purchase, but, by guaranteing the future of the system, could convert excess 'dividends' into a purchase fund and thereby secure the controlling equity."

The estimate of the "cost to reproduce" includes two important items—Real Estate for Car Houses, Substations and Shops, and Private Right of Way.

In accordance with Supreme Court decisions, the corporation was given the benefit of the appreciation in real estate values.

The report includes the following important statement made in this connection:

"It has been the practice, however, in evaluating railroad property for rate-making purposes, to give rights of way for railroad purposes a greater value than the adjoining land, and this practice has been approved by a number of commissions who have recognized various multiplying factors—some as high as three times the real estate value. Since the supreme court has decided that public utilities are to be given the benefit of the appreciated value of their land holdings in establishing their present worth, the problem of determining the value of terminal lands and rights in connection with railroad rate-making will become a very critical part of the rate question.

"In this particular case, if the fare is to be reduced, the railway company, no doubt, would claim that their perpetual rights to occupy the private rights of way have a strategic value a number of times larger than the values given and which we based upon the sales value of contiguous real estate, without using any multiplying factor."

The condensed report is summarized in the following recapitulation of fundamental facts:

1. Compared with other American cities, the local electric street car track mileage in Los Angeles is liberal for the area covered and the population served. As the districts reached by the local lines "build up" in density of population the income per mile of track may be more than doubled.

2. The system is just emerging from the "stage of development" onto a paying basis. Past earnings have not been sufficient to take care of a large allowance for depreciation and nothing for amortization.

3. Car service has been supplied on the policy that the riding habit can be cultivated by good service and the results have justified this policy, The rides per capita are very high—averaging nearly a ride per inhabitant per day—a record exceeded only by San Francisco, where the income per capita is $18.35, as compared with $16.20 in Los Angeles.

4. The present interest charges of 5 per cent on the original debt of $20,000,000 and 5 per cent on the actual cost of extensions financed through the City the original bonded debt of $20,000,000 and 5 per cent on the actual cost of extensions financed through the City Railway Company's account is "a reasonable return upon the present actual physical value" of the

system—but is not sufficient to compensate for "hazard" and "enterprise" in creating the property.

5. An annual "dividend" of 2 per cent on $20,000,000, or $400,000 yearly, is a reasonable reward for hazard and enterprise and should be allowed as long as present uncertain conditions continue.

6. An additional "dividend" of a larger amount than $400,000 annually is not justified by present net earnings. The payment of a dividend of $800,000 out of the current year's earnings was made possible only by anticipating net earnings—by using the depreciation reserve fund, or by borrowing money—any or all of which are dangerous practices.

7. Future "dividends" on account of returns over and above interest charges should depend in amount upon the extent of the hazard. If the risk to the investor is reduced, the rate of return should be correspondingly lowered.

8. The present five-cent fare, if continued during the coming year under present operating conditions and with a normal increase in earnings, will produce a surplus over and above the amount sufficient for interest charges and reasonable dividends. The control of this surplus should be in the hands of a public regulating body, which should decide upon the disposition of this part of the surplus net earnings for any or all of the following purposes: Better Service, Extensions, Renewals, Amortization, or Fare Reduction.

9. Considering the demands of the community for improved service and extensions, it is safe to conclude that a situation calling for a reduction of fares will not be reached in Los Angeles for a few years—but if the present rates of increase in population and passenger earnings are maintained a density of traffic can be anticipated in time which will justify a reduction from the present five-cent fare.

10. In anticipating future developments, it is safe to conclude that earnings will increase at a remarkable rate; that the percentage of earnings required for operating expenses should gradually decrease and that the ratio of investment to earnings should also be reduced—thus making the burden of fixed charges relatively lighter.

11. The local traction situation as compared to that in other cities is at present favorable to Los Angeles. The problem is to avoid the capitalization of the future possibilities.

12. The present management of the Los Angeles Railway Corporation is working under the following disadvantages:

(a) The franchise fabric is a patchwork.

(b) Many franchises expire before the bonds covering the investment are due in 1940. This $20,000,000 first mortgage bond issue, covering the greater portion of the property, is a closed mortgage and does not allow for the issue of any additional bonds to take care of improvements and betterments on the property covered by the mortgage.

(c) Extensions are made by a subsidiary company and the securities of this company are protected only by the piecemeal extensions and additional equipment, resulting in a limited market for these betterment bonds. Under present circumstances it is necessary for Mr. H. E. Huntington to buy these bonds personally.

(d) Constant growth requires money for improvements and extensions at a rate greater than the entire net earnings—so that if all the interest and dividend payments are reinvested, as has been the practice, it is still necessary to find about $500,000 a year new money in order to carry on the enterprise.

(e) During the next ten years the amount of money required for extensions and betterments will amount to fully as much as the present investment. To secure this capital it must be protected. The present franchise and financial arrangements do not afford the necessary protection.

(f) The sinking fund provision of the $20,000,000 bond issue will retire only about 40 per cent of the issue at the end of the 30 years' life of the bonds. Without any assurance that new franchises will be granted, the company is not in a position to continuously develop its property as a comprehensive system.

(g) No insurance fund is provided, nor is any amount set aside to provide a surplus for accidents, loss of business, panics or other contingencies.

(h) The recent political evolution which places powers of control of public utilities in the hands of the city and the state puts an entirely new aspect upon the development of the urban transportation business. If the public have the right to regulate rates, to control service, to order extensions both of lines and of the five-cent fare zones; to limit the return on the investment; to audit accounts, and to approve or disapprove the issue of securities, then there is lacking the incentive for the financier to build up the business with the expectation of extra large gains.

13. On the other hand, the city is working under disadvantages which can be briefly summed up as follows:

(a) There is no comprehensive franchise policy. The model franchises, the limitations of future grants to 21 years and the indeterminate provisions in recent permits reserving the right to purchase by the city, apply only to extensions and not to the entire system.

(b) There are numerous legal tangles in present franchise grants which may involve the city in tedious and expensive litigation before it can secure back again full control of its own streets.

(c) If the city endeavors to reduce fares at this time a controversy is inevitable, as the company claims it has eminent legal advice that their present franchises intrench them securely upon a five-cent fare basis.

(d) To attack the company with drastic regulation or franchise litigation will injure the credit of the company and the city. The unwise use by the city of these two clubs—regulation and litigation—will add to the hazard and expense rather than reduce them and must eventually increase rather than decrease the cost of city transportation.

The foregoing exposition of the actual weaknesses in the fortifications of each the company and the city, seems to show conclusively just one thing, viz:

Co-operation of the two, or "getting together" on a basis of the full rights of each party is the only way out.

Taking a broad view of the entire situation, the tendency of developments points to the advisability of the city and the company entering into a settlement agreement.

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POWER AND GAS

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Recognition of Western Rights

The Annual Report of Secretary of the Interior Franklin K. Lane is, in our opinion, the most enlightened and enlightening document which has ever come from the Department. The Secretary throws the light of his actual knowledge of local conditions into the dark corners of old controversies and makes a clear statement of policy as to the development of the national resources of the West. He recognizes the feeling that the former Federal policy has been unjust to the West in that while it closed opportunities to the monopolist it did not open them to the developer. He makes constructive suggestions for legislation that will enable active use of idle lands for the purposes to which they are best adapted. While the entire report as to conditions in Alaska, coal lands, petroleum, phosphate, potash, forests and reclamations are of great interest to the readers of these columns his remarks as to power sites are most significant:

There must surely be a rational way by which capital may be brought into this public service. The present condition of stagnation does no one good. Within a generation I believe the people will be as alive to the value of public ownership of hydroelectric power plants as they are today to municipally-owned water works. The people not being prepared, however, to put these lands to their highest use, I am not in favor of keeping them from being utilized by private capital in the public interest. Because we do not know what is best to be done is not a reason either for doing nothing or for getting rid of the trouble as soon as possible on the old "land-is-land policy."

When capital is given a fair and attractive interest with assurance of full return the public can be given good service and fair rates by regulating commissions. But when society takes the lion's share of the profit and yields no more to the operator than will make his work sufficiently attractive to keep him at it the impossibility of competition without waste is being attempted. In a new country where there must be large development and higher rewards for private enterprise some concessions might well be made.

What return shall the Federal Government have for its lands? My answer would be, no return whatsover, provided the plant reverted to the government without cost at the end of 50 or 60 years, or so much of the plant as was based on the land itself and the improvements directly attached thereto, such as reservoirs, dams, water rights, and rights of way. For the tangible property of the plant, such as the distributing system and machinery, the government might well agree to pay an appraised price so as to insure its being maintained and extended during the later years of the life of the franchise.

Some may question whether the people of the United States will be ready for such governmental ownership within such a short time. Time is a necessary element in every evolution such as this and many believe that ninety-nine years would allow a less abrupt transition. Of course government ownership does not necessarily imply governmental operation. The experience of the Reclamation Service has already demonstrated that the operation and management of irrigation projects should be turned over to water-users' associations. Some other course may suggest itself later so that the needs of the users can be better accommodated than by governmental operation.

However, these suggestions are somewhat aside from the main issue. Such governmental endorsement could not help but be beneficial to the stability of power securities. The bond of a hydroelectric company would be as good as a government bond. And in return the government would be adding to its assets by having at its service the greatest brains of the nation in developing those resources that will eventually revert to the government.

Home Lighting

Architecture, decorations, furniture, atmosphere, safety, and the conservation of vision, each and all have some bearing upon the correctness of home lighting installations. Made properly and with due regard to all these, and economy is the remarkable result.

Today is a growth of yesterday and because this is so, the inertia of habit or custom, oftentimes difficult to overcome, is costly.

Yesterday the tallow dips, more economically made in quantities than at home, and secured with so much greater ease and cleanliness, were bought at the chandlery and hardware stores which, upon introduction of the oil lamps made of tin, sold these too, together with wicks and glass chimneys. Then came the more ornate lamps and the stores which sold the oil still held onto the sale of lamps.

Gas as a competitive illuminant, because of the method of its installation provided additional work for the plumber and even with the specializing of gas-fitting, the plumber-gas-fitter still holds his own.

The popularizing of electricity threatened to curtail a profitable part of his employment and in self-preservation, he hastened to adjust himself to this new condition by undertaking contracts for electrical installations.

As a transition period makeshift, this arrangement was excellent. But in order to keep abreast the times and so serve patrons satisfactorily, in the broadest sense of the word, specialization is essential. That plumber-electricians' have left a baneful influence upon home lighting is evidenced in the thousands of homes in which lighting installations improperly made are in urgent need of remodelling.

There were those too who sprung into existence to do this work exclusively but with the idea of "get the business anyway." They also cheapened this work, not because of any better method, but by the use of fixtures of indifferent and antiquated design, made cheaply and with a sincere disregard of the purposes for which lighting fixtures should be installed.

But home lighting is one of the refinements which not only calls for work well done and with the best of materials, but also for an exercise of artistic ability which recognizes the fitness of things—the interdependence of each instrument in rendering complete harmony.

With so wide a relationship between other aspects of interiors and the lighting it is small wonder that many specialists have sprung into existence with the idea of catering to this need. Fixture dealers with their specialties, and fixture and lighting studios are a natural and necessary consequence of a demand for the best in home lighting.

As opposed to the work of the plumber-electrician and his kind, their charges may appear excessive. But it is an appearance which is all on the surface, for underneath is the harmony, comfort, convenience, health, happiness and ultimate economy which is the invariable result of things well done.

In our department on Lighting Methods has been commenced in this issue a series of articles on home-lighting. These will aid in the giving of better service along this line and make for those improved standards the realization of which is the main object of this department.

Localization

The benefits of centralization of men and of capital have been great as compared to the results of the competitive conditions which it displaced. But every light has its shadow, every force its reaction, every good its evil. The great law of compensation is ever trying to establish an equilibrium which only the greater law of change can prevent. Some change now seems necessary to keep the advantages of centralization from being overwhelmed by its disadvantages.

Shade is grateful by contrast with the brilliant light of which it is the result; a force is supported by its resistance.

But with excess, correction is necessary. While the trouble may be stopped by shutting off the light or stopping the force, it is usually better to supply some neutralizing force to minimize the evils without destroying the benefits.

Because of the evils of city life it is not advisable that all men go back to the farm. But with more men on the farm there will be more work in the city. Such a solution of the problem of human centralization is suggestive of how to meet the difficulties of other kinds of centralization.

While eggs cannot be unscrambled as eggs, they can be assimilated by the body as albumen and fat. Dissolution of a compound need not produce the components from which it was originally formed. So when the great railroad systems were dissolved, the oil company dissociated and the tobacco trust broken they did not revert to the former condition of smaller companies competing from several centers for business in the same field. They formed new companies, each to serve its own territory and provide more intensive cultivation of the local market. Whereas these great aggregations were formed by a process of centralization, they have been re-formed by a method of localization.

Today far-seeing leaders are not waiting for a court decree but are voluntarily converting their organization into discrete units. The manufacturing end is being segregated from the sales end, and selling is being subdivided to meet the special requirements of each locality.

This process is pregnant with thought if applied to the special problems of every big organization. To decrease the overhead, augment instead of restrain trade, improve service to the consumer, and lessen vulnerability to overt attack—all this and more can be accomplished by following the dictates of the handwriting on the wall.

PERSONALS

ITEMS FOR THIS DEPARTMENT ARE SOLICITED FROM ALL READERS

Jno. Gilbert of Gilbert Bros., electrical contractors, San Jose, visited San Francisco during the past week.

Geo. L. Pierce, city electrician, Sacramento, was at San Francisco for several days during the past week.

H. Hayes, purchasing agent Mt. Whitney Power and Electric Company, was at San Francisco last week.

O. F. Swenson, salesman with Hunt, Mirk & Co., Inc., is making a business trip through Oregon and Washington.

H. S. Clark, Pacific Coast representative of Westinghouse Church-Kerr Company is on a business trip through Southern California.

Earl Fischer, commercial department Pacific Gas and Electric Company, has been called to Idaho on account of the illness of his father.

Richard E. Smith has been appointed California representative of the National X-Ray Reflector Company, with offices at 129 Sutter street.

A. T. Lloyd, local manager The Baker-Smith Company at San Francisco has left for an extended business trip throughout Southern California.

Geo. A. Boomer, Pacific Coast representative Plume & Atwood Manufacturing Company, is on a business trip throughout Southern California.

Thomas Mirk, president Hunt, Mirk & Co., Inc., San Francisco, expects to return to San Francisco from Seattle during the early part of the week.

J. B. Lukes, representing Stone & Webster Construction Company, San Francisco, left last Monday for the East and expects to be away for at least one month.

L. M. Cargo, district manager Westinghouse Electric and Manufacturing Company, with headquarters in Denver, is at Salt Lake City on his regular visit of inspection.

Sylvester Baker, Pacific Coast representative, Macbeth-Evans Glass Company, left San Francisco last week for a two months' trip through the southern part of his territory.

Chas. W. Wilson, erecting engineer The Westinghouse Machine Company, East Pittsburg, Pa., is at Honolulu erecting machinery supplied to the Hawaiian Electric Company.

W. G. Bryant, president, and E. J. Patton, general sales manager, of the Bryant Electric Company, located in Chicago, on a business trip to the Pacific Coast, arrived in San Francisco the latter part of the week.

Thomas M. Hurlburt and Harold A. Rando, civil and consulting engineers, have entered into a partnership and have opened offices at 502 Henry building, Portland. Mr. Hurlburt was formerly city engineer of Portland.

W. L. Goodwin, vice-president of the Pacific States Electric Company, announces the preparation of a paper on "What the Joint Committee of Contractors and Jobbers Stands For." It is contemplated to publish same at an early date.

Geo. P. Maddock has succeeded Harold Almert, resigned, as manager of the examinations and reports department of H. M. Byllesby & Co. Mr. Maddock has been the engineering representative of the company on the Pacific Coast for a number of years, residing at Berkeley, Cal.

Stanley Stevens, manager electrical department Fairbanks-Morse Company, Salt Lake City, left last Friday for Chicago and the East. While away he will visit the various factories of the Fairbanks-Morse Company and attend the annual salesmen's meetings at the company's general offices.

Merrill P. Robinson, illuminating engineer, formerly with the "Eye-Comfort" System in their Chicago office, is now connected with the Capital Electric Company, Salt Lake City, who will specialize on this system of lighting throughout the territory served by them, with Mr. Robinson in charge of this work.

Charles T. Leeds, formerly in charge of United States river and harbor work improvements in Southern California, and Wilfred K. Barnard, formerly engineer of maintenance of way and structures, Pacific Electric Railway Company, announce the formation of the firm partnership of Leeds & Barnard, and will engage in the general practice of engineering, with offices at 511-515 Central building, Los Angeles.

MEETING NOTICES.

Electrical Development and Jovian League, San Francisco.

The regular monthly business meeting of the League was held last Tuesday. Consideration of committee reports and routine business was the order of the day.

Oregon Society Engineers.

The Oregon Society of Engineers had its regular monthly meeting in Room "A" of the Central Library Buiding, at 8 o'clock, Thursday evening, January 8th, when Mr. Robert E. Edwards gave an illustrated lecture on "Concrete Roads."

Pacific Coast Electric Supply Jobbers' Convention.

The quarterly meeting which is scheduled for Del Monte will probably be held somewhere between the fifth and tenth of March and a large attendance is anticipated. Many eastern houses have signified their intention of sending out representatives to the gathering.

San Francisco Section, A. I. E. E.

The regular monthly meeting of the San Francisco section of the American Institute of Electrical Engineers will be held at Native Sons' Hall, 430 Mason street, at 8 p. m. January 23. Guy H. Bayley, chief electrical and mechanical engineer for the Panama-Pacific International Exposition, will present a paper and lantern slides on "Electrical Features of the Exposition," with particular reference to the distribution system. The public is invited. A dinner at the Hof-Brau will precede the meeting.

Pacific Northwest Society of Engineers.

This society held its twelfth annual meeting and dinner at the Arctic Club, Seattle, on Saturday evening, January 3, 1914, when the following officers were elected: Joseph Jacobs, president; Marvin Chase, Sterling B. Hill and Carl H. Reeves, vice-president; Jesse A. Jackson, secretary; Wendell N. Chase, treasurer; Climie E. Hill, librarian; J. D. Blackwell, Almon H. Fuller, D. W. McMorris, Milner Roberts, in-town directors; and J. J. Cryderman, Geo. A. Kyle. T. A. Noble and R. H. Thompson, out-of-town directors.

N. E. L. A. Transportation Committee.

At a meeting of the Transportation Committee of the National Electric Light Association at Philadelphia on January 8th, Chairman G. W. Elliott stated that a rate of 2c per mile had been quoted by the Grand Trunk Association in connection with the transportation of delegates to the Philadelphia convention. No special trains are to be run from New York or Boston. With regard to possible decision to hold the convention at San Francisco in 1915 it was the consensus of opinion that the trip should not be made as a tour, but that the committee would obtain further information and rates relative thereto, after which the matter would be again taken up by the committee for further discussion.

Jovian Electrical League of Southern California.

The regular weekly meeting of the Jovian Electrical League of Southern California was held Wednesday noon at Christopher's. Meyer Lissner delivered a very interesting address illustrated with stereopticon pictures, the subject being Camera "Flashes" during a "Short Circuit" of Europe. Max Loewenthal presided as chairman. A rejuvenation will be held February 6th. As a large number of applications have already been received a record class is expected.

The regular weekly luncheon of the Jovian League of Southern California was held at Christophers' on January 14,

J. O. Case being chairman of the day. Mr. Martin Betkouski spoke on "A Councilman—His Relations to the Public." Through the courtesy of the Garrick Theatre the members were also entertained by Professor Edward B. Warman, "human electricity." G. E. Arbogast will be chairman of the day on January 21st. A Jovian rejuvenation will be held on Friday, February 6th, at 6:15 p. m., at Union League Club. Out-of-town Jovians are particularly invited to attend.

Portland Sections A. I. E. E and N. E. L. A.

The January meeting was held on January 6th in the assembly rooms of the Hawthorne Building. Mr. B. S. Durkee's paper on "Duplex and Quadruplex Telegraphy" was a simple and forceful presentation of the subject and was enjoyed by the members in attendance.

Mr. A. S. Moody delivered a lecture with lantern slides on "Hydroelectric Developments on the Pacific Coast," which was well received.

The chairman called attention to the next Pacific Coast Convention in Spokane, September 9, 10 and 11, and urged every one to attend as he was sure it was going to be one of "the best ever."

The next joint meeting of the A. I. E. E and the N. E. L. A. will be a "social meeting," including dancing, on February 3d.

Efficiency Society Conference.

"What is meant by Efficiency" will be answered fully at the First National Efficiency Exposition and Conference to be held at the Grand Central Palace, April 4 to 11 (inclusive) 1914. Its aim and purpose will be to give expression to the increasing application of scientific methods to modern conditions. The plan and scope of the show will include displays of efficiency appliances, methods and products in Industrial, Mechanical, Governmental, Educational and Household fields; a series of mental and manual efficiency contests will be staged and conferences and illustrated lectures will be given. It will be held under the auspices of the Efficiency Society and in conjunction with the conferences of the society and other scientific organizations. The exhibits which will include displays by federal, state and municipal departments, public service corporations, office and household appliance manufacturers, vocational training schools and others.

Utah Electric Club.

The annual meeting of the Utah Electric Club held at the Commercial Club Thursday, January 8th, was given over to the election of officers and four new directors to succeed to the places of the directors whose terms expired on that date. The retiring directors were: C. B. Hawley, H. R. Bucks, W. W. Torrence, J. C. Jones. The newly elected directors are: W. W. Torrence, local manager General Electric Company; H. W. Kline, superintendent of plant, Mountain States Telephone & Telegraph Company; C. B. Hawley, president and general manager, Intermountain Electric Company; W. M. Scott, superintendent of electric lines and service, Utah Light & Railway Company.

After the annual meeting the board of directors met and elected the officers for the ensuing year. W. W. Torrence was elected president in recognition of his valued and untiring service as secretary of the club during the past year, W. M. Scott, vice-president and R. W. Mendenhall, secretary.

SAN FRANCISCO JOVIAN REJUVENATION.

A rejuvenation of the Jovian Order was held at San Francisco on Saturday night, January 10, under the direction of Statesman A. E. Rowe. The ceremony was conducted in the Elks' Hall, which allowed abundant opportunity for an able presentation of the impressive ritual by the following degree team:

Jupiter, A. E. Drendell.
Neptune, A. H. Halloran.
Pluto, F. D. Fagan.
Vulcan, S. L. Hawkins.
Hercules, John R. Cole.
Mars, A. H. Elliott.
Apollo, C. F. Butte.
Avrenim, F. H. Poss.
Mercury, W. W. Hanscom.

The serious aims of Jovianism in developing the value of the individual were set forth by Reigning Vulcan A. H. Halloran. Afterwards refreshments were served and an interesting entertainment of song, stories and pictures provided The following were made rejuvenated beings:

H. G. Aylsworth, vice-president and general manager, Aylsworth Agencies Co.
S. A. L. Baker, Pacific Coast mgr. Macbeth-Evans Glass Co.
P. S. Benjamin, U. S. Steel Products Co.
W. K. Brumfield, president Brumfield Electric Sign Co.
F. I. Du Frane, telephone department, Western Electric Co.
E. D. Eichenlaub, Electric Appliance Co.
G. M. Fisk, chief inspector, Department of Electricity.
E. P. Gibson, agricultural specialist, General Electric Co.
A. M. Jones, salesman John A. Roebling Sons' Co.
Roger Keith, salesman Western Electric Co.
Arthur Kempston, assistant chief Department of Electricity.
R. C. Mixer, motor salesman General Electric Co.
E. R. Murray, salesman Western Electric Co.
E. W. Regensburger, supt. Gas & Electric Appliance Co.
R. E. Smith, supervising engineer, National X-Ray Reflector Co.
C. A. Turner, engineering dept. Pacific Tel. & Tel. Co.
William Weston, chief price clerk Electric Appliance Co.
F. W. Wilson, salesman Standard Underground Cable Co.

INDUSTRIAL SAFETY CONFERENCE.

An industrial safety conference will be held at the University of Nevada, Reno., Nev., on January 26 and 27, 1914, which, on account of the various interests represented and the range of the papers to be presented and discussed, promises to be of great value and interest.

The morning session on Monday, January 26, will be entirely taken up by Railway Apprentice Instructors, who will hold their conference at that time.

At 2 p. m. the same day the meeting will convene with His Excellency, Governor Tasker L. Oddie, as presiding officer. W. R. Scott, general manager Southern Pacific Company, and J. W. Wallace, State Industrial Commissioner, will be the honorary presiding officers.

Papers will be presented by J. J. Mullin, secretary of the State Industrial Commission, on the "Safety First" movement in Nevada; by L. E. Abbott, commissioner of safety, Oregon Short Line, on "Safety First on the Oregon Short Line"; and by Hon. H. F. Bartine, chairman State Public Service Commission, on "Safety Regulations for Electric Power Companies." Ten-minute discussions of these papers will follow by representatives of Nevada-California Power Company, Truckee River General Electric Company, Elko-Lamoille Power Company, Reno Power, Light & Water Company, Esmeralda Power Company and the Pacific Power Company.

This discussion will be followed by an important paper on "Electric Headlights," by J. G. Scrugham, professor of mechanical and electrical engineering, University of Nevada, and will be discussed by delegated representatives of Brotherhood of Locomotive Engineers, Brotherhood of Locomotive Firemen, Brotherhood of Railway Trainmen, Southern Pacific Company, Western Pacific Railroad, Tonopah & Goldfield Railroad, Nevada-California-Oregon Railway and the General Electric Company.

At the evening session to be held at 7:30 o'clock, the presiding officer will be P. E. Raymond, president University of Nevada Engineers' Club. A labor representative, whose name had not been received at the time of going to press, together with H. A. Lemmon, State Industrial Commissioner, will be the honorary presiding officers. The program will consist of (1) Demonstration of Wireless Telephone and of Discharges of High Potential Electricity (2) Motion Pictures—The Manufacture of Steel—Loaned by United States Steel Corporation, (3) of University Campus and Laboratories, and (4) Miner at Work and Mine Explosion and Rescue—Loaned by the U. S. Bureau of Mines.

A special train will also be provided to convey those interested to some point on the line where a series of tests will be conducted under the auspices of the electrical department of the University.

On Tuesday, at 10 a. m., there will be a conference of apprentice instructors.

The electrical section will meet at 1 p. m, and will be presided over by Mr. Raymond, with B. G. McBride, manager Elko-Lamoille Power Company, and C. W. Whitney, Natomas Consolidated of California, as honorary presiding officers. A paper on "The Organization and Development of the Electrical Manufacturing Industry," by R. M. Alvord, manager supply department General Electric Company, will be read.

At the 2 o'clock session Hon. E. S. Farrington, Judge United States Court, will be the presiding officer, with Jno. G. Kircher, president Mine Operators' Association, and a labor representative, as honorary presiding officers. "Industrial Safety" will be presented by W. J. French, Industrial Commissioner State of California; "The Nevada Industrial Commission," by Geo. Thatcher Attorney-General of Nevada; "Accident Prevention in Mines," by Ed. Ryan, State Inspector of Mines, assisted in demonstrations by the mining department of the University; "First Aid to the Injured" will be presented by Professor Peter Frandsen of the University of Nevada, and will be discussed by Dr. O. P. Johnstone, S. K. Morrison and D. McLean. "Safety Precautions of the Nevada Consolidated Copper Company," by Lindsay Duncan, mechanical engineer, and "The National Safety First Congress in New York," by Rev. Lloyd Thomas will conclude the papers.

Then will follow the reading of communications, further motion pictures, loaned by the U. S. Bureau of Mines, and the organization of a State Safety Council.

At 6 p. m. the annual dinner of the University of Nevada Engineers' Club will be held, presided over by Hon. Chas. B. Henderson, Regent of the University of Nevada. Among the speakers will be His Excellency, Tasker L. Oddie, Governor of Nevada; several labor representatives; C. V. Jenkins, business manager Nevada Consolidated Copper Company and Steptoe Valley Mining & Smelting Company; W. R. Scott, general manager Southern Pacific Company, and Dr. J. E. Stubbs, president University of Nevada.

It is largely due to the interest and untiring efforts of Professor Scrugham that this conference on industrial safety has been inaugurated and so successfully launched.

TRADE NOTES.

A. L. Parkhurst is erecting a two-story brick building on the northwest corner of Couch and Second street North.

M. L. Glisar is erecting a two-story brick building on the northeast corner of Fifth and Couch streets. Camp & DuPuy. Inc., are builders and architects.

NePage, McKenney & Company have secured the electrical contract for the building on the southeast corner of Fourth and Burnside street, Portland, Oregon.

The building department of the city of Portland, Oregon, has written specifications for the remodeling of the lighting system in the city hall. Bids will be called for shortly.

The Portland Ice Hippodrome, which is being built on the southwest corner of Twentieth street North and Northrup street. Mr. Arthur J. Maclure, architect, 317 Lewis Building.

Fred H. Koltz, 218 Worcester Building, has the electrical contract for the store building and garage located on the northeast corner of Broadway and E. Everett streets, Portland, Oregon.

Condarr-Noonan & Company are agents representing the owners who are erecting a first class theater on the half block on the south side of State street between Park and Seventh streets; seating capacity to be 2200.

Vanderlip & Lord have the electrical contract for the two-story reinforced concrete warehouse being erected for Olson & Rowe Transfer Company, on the southeast corner of Fifteenth street North and Hoyt street, Portland, Oregon.

W. S. Turner, consulting engineer, Spaulding Building, has written the specifications for the lighting and power systems in the Northwest Steel Company's new plant in South Portland. The switchboard is the only portion that will be contracted.

The Novelty Sign Company, San Francisco has been awarded a contract for the construction of an electric sign featuring Heinz 57 varieties. There will be figures on this sign 30 ft. high. It is to be installed on lower Market street.

The Westinghouse Lamp Company announces the removal on January 19, 1914, of its administrative, executive sales, treasury, auditing and purchasing departments from Bloomfield, N. J., to the Martin Building, 1261 Broadway (corner of 31st street), New York City.

Only two bids were submitted on complete equipment for the city power station at Seattle, although several were submitted on separate items. Hunt, Mirk & Company submitted a bid of $139,000, but their bond was unsigned. Chas. C. Moore & Company submitted a bid of $149,000. It is probable that new bids will be called.

The Pacific States Electric Company, Los Angeles branch, have occupied the new quarters recently completed for that concern at 236-38-40 South Los Angeles street. The new store occupies five stories and basement and is in many ways a counterpart of the company's model San Francisco plant, being equipped with all the latest devices for expeditious handling of customers, sample, stock and display rooms, while on the office floor, the system of glass partitions has been adopted.

DIRECTORY OF WESTERN PUBLIC SERVICE COMMISSIONS.

Arizona Corporation Commission, Phoenix, Ariz.

Commissioners:	Officers.
W. P. Geary, Chairman.	Frank De Sousa, Secretary.
A. W. Cole.	Edgar A. Brown, Rate Expert.
F. A. Jones.	Ben Ferguson, Engineer.

California Railroad Commission, San Francisco.

Commissioners:	Officers.
John M. Eshleman, President.	Chas. R. Detrick, Secretary.
H. D. Loveland.	H. H. Sanborn, Rate Expert.
Alex. Gordon.	W. C. Earle, Chief Engineer.
E. O. Edgerton.	L. R. Reynolds, Auditor.
Max Thelen, Attorney.	P. S. Sinsheimer, Bond Expert.

Idaho Public Utilities Commission, Boise, Idaho.

Commissioners:	Officers.
J. A. Blomquist, President.	E. G. Gallet, Secretary.
A. P. Ramstedt.	H. H. Miller, Accountant.
D. W. Standrod.	

Montana Railroad & Public Service Commission, Helena, Mont.

Commissioners:	Officers.
D. Boyle, Chairman.	R. F. McLaren, Secretary.
E. A. Morley.	Oscar Reynolds, Engineer.
J. H. Hall.	

Railroad Commission of Oregon, Salem, Oregon

Commissioners:	Officers.
Frank J. Miller, Chairman.	H. H. Corey, Secretary.
Thomas K. Campbell.	R. H. Dearborn, Utility Eng'r.
Clyde B. Aitchison.	E. W. Moreland, R'way Eng'r.

The Public Service Commission of Washington, Olympia, Wash.

Commissioners:	Officers.
M. M. Godman, Chairman.	J. H. Brown, Secretary.
Arthur A. Lewis.	F. S. Burroughs, Engineer.
Frank P. Spinning.	O. O. Calderhead, Rate Expert.

NEWS NOTES

INCORPORATIONS.

SAN FRANCISCO, CAL.—California Electric Supply Company, $25,000, shares $10 each, subscribed $30, by J. Hepburn, J. F. Walters and R. Hepburn.

SAUSALITO, CAL.—Marin County Electric Railway, $100,000, shares $100 each, subscribed $300, by B. F. Ames, A. Harper and W. W. Hicks, all of San Francisco.

ILLUMINATION.

LAPWAI, IDAHO.—The Lewiston Electric Light & Power Company has applied to the municipal board for a franchise.

SAN FRANCISCO, CAL.—The supervisors have given final passage to the ordinance regulating electric wiring of buildings and installing of electric fixtures.

GLENDIVE, MONT.—Arc lights will be installed on Merrill avenue at an estimated cost of $4500. Elnar Rivenes and Frank C. Huges are the committee on this project.

PORT ANGELES, WASH.—A franchise has been granted to the Olympic Power Company and that company will furnish power as soon as the electric light company announces the substation ready.

AUBURN, WASH.—The commissioners have designated January 27th as the date for hearing the petition of the municipal light plant for a franchise to supply light and power in the White River valley.

BREMERTON, WASH.—A special election has been ordered to vote on the proposition on a proposed municipal light and power plant to cost about $350,000. The project is planned to develop 3000 h.p. with an ultimate capacity of 10,000 h.p.

TUCSON, ARIZ.—Expenditure of $200,000 is contemplated by the Federal Light & Power Company in the improvement of the local lighting and street railway equipment. Projected are several important extensions of electric railway lines, new machinery at the generation plant and new gas mains.

CENTRALIA, WASH.—Acceptance of the franchise granted to the Washington Public Service Corporation by the Thurston County Commissioners to build and operate a system of electric light and power lines through the southeastern part of the county has been made by officials of the corporation. The proposed lines will extend from Olympia through Tenino to Grand Mound and over to Gate City. Light will be furnished to small towns and farmers along the way.

OAKLAND, CAL.—Considerable interest had been centered in a "wireless eye" by which the inventor claimed to be able to pierce the darkness of night for many miles around. The "invention" investigated by the police department revealed that the panorama presented through the machine was the result of the light rays of an incandescent lamp shining through a pin pricked movie film of the surrounding district. The "inventor," who was selling stock in a company formed to exploit the machine, was arrested.

LOS ANGELES, CAL.—The Southern California Edison Company has filed with the railroad commission a new rate schedule which will reduce the cost of service to consumers in Los Angeles, San Bernardino, Riverside, and Orange counties. About twelve months ago the company put into effect a maximum lighting rate of 8 cents per kw.-hr. The reduction resulted in a considerable saving which will be increased by this further reduction to 7 cents per kw.-hr. as the maximum rate. This will bo into effect on March 1st.

TRANSMISSION.

SAN FRANCISCO, CAL.—By a vote of 2 to 1, the Light and Power Council of California decided to abandon the strike maintained since last May against the Pacific Gas and Electric Company.

LACOMBE, ALTA.—This municipality will shortly install an engine type 100 kw. 277 r.p.m., 2300 volt, 3-phase, 60-cycle generator. E. J. Tett is secretary-treasurer and commissioner.

EDMONTON, ALTA.—Offers are being prepared by private companies which purport to be able to supply electric power cheaper than it is being generated by the municipal plant. It is proposed by one of these companies to generate the power at the pit mouth of a nearby coal mine and transmit it over high tension lines to this city.

LOS ANGELES, CAL.—The Vernon substation of the Pacific Light & Power Company was completely destroyed last week by fire caused it is thought, through lightning. Notwithstanding the fact that this substation carries more than 50 per cent of the load, it was but a few hours before normal traffic conditions were restored.

SAN FRANCISCO, CAL.—The works board has been advised by the city attorney that it has no right to refuse to a public service corporation a permit to open streets which it already occupies, if the corporation makes the necessary deposit as provided by the ordinance regulating the opening of streets and otherwise complies with the ordinance.

TULARE, CAL.—The Mt. Whitney Power & Electric Company is making a survey for a transmission line from No. 3 plant direct to Lindsay. This will be a steel tower construction following the present line to Lemon Cove, thence in a straight line to Lindsay. Actual construction will begin shortly. All construction work on the Wolverton dam project has been abandoned for the winter and will not be resumed until some time in April.

LOS ANGELES, CAL.—The Southern California Edison Company is building 12 miles of road in San Bernardino county, at an estimated cost of $100,000 preparatory to expending $1,000,000 for two additional generating power plants. The work includes 8 miles of concrete line flumes and tunnels, and parts of the road will go straight through rocky cones. All work is being done by the Edison company at present, but it is probable that the rock drilling will be let by contract.

GREAT FALLS, MONT.—There has been filed in the county recorder's office here a mortgage whereby the Montana Power Company places a lien upon its properties in this state to the extent of $75,000,000 in favor of the Guaranty Trust Company of New York. It was explained by John G. Morony, vice-president of the power company, that the mortgage was given in security for bonds dated July 1, 1913, and falling due on July 1, 1943, to the amount of $17,000,000, and such other bonds as may be issued by the company from time to time. The company is the owner of several power plants at various points in the state, including two at Great Falls.

FRESNO, CAL.—The new Tule River plant of the San Joaquin Light & Power Company has been put into operation, although some finishing work remains to be done. It will greatly relieve the strain under which the company has been operating, as a result of the two dry spells in the San Joaquin Valley. The recent rains have poured large quantities of water into Crane Valley Lake, the main reservoir of the company, and it is rising rapidly. Reports from the mountains indicate that there is a heavy mantle of snow on the hills above the lake, and as there are prospects for more snow before the winter season is over, the power company people express the belief that there will be plenty of water in Crane Valley Lake for all requirements next summer and fall.

MURRAY, UTAH.—The Progress Company of Murray has entered into a contract with Murray city whereby all of the surplus power from the municipal plant, the installation of

which has just been completed by the city, will be taken by the Progress company. At the same time a joint pole line agreement was entered into between the Progress company and the city whereby each has the right to use the poles of the other for stringing its wires. These two contracts appear to afford a fairly satisfactory solution of the situation which has recently arisen as a result of the installation of the municipal plant. The municipality does not agree to change its former plan of supplying electric street lighting and commercial electric service within the corporate limits of Murray City, but owing to the fact that they receive a fairly good price for their surplus power, they will not find it advantageous to extend operations to the surrounding communities. The contract will provide for a rate of $3.50 per kilowatt per month on the basis of the maximum demand used.

TRANSPORTATION.

NELSON, B. C.—At the January elections, by-laws will be submitted authorizing the raising of $30,000 to pay debts and provide for improvements on the street railway system.

SAN FRANCISCO, CAL.—The quarterly report of the California Street Cable Railway for the three months ended September 30 shows but four accidents. Three of these were slight in character.

SAN FRANCISCO, CAL.—A resolution was adopted by the supervisors requesting the United Railroads to build and operate a street railway upon Richmond avenue, between Mission and Andover streets, in accordance with a franchise granted in 1892, and passed to print.

SALT LAKE CITY, UTAH.—The Utah Light & Railway Company announces that on account of the rapidly increasing business on its interurban line to Holliday ten miles southeast from the city, the service on this line will be practically doubled during 1914.

MISSOULA, MONT.—The Chicago, Milwaukee & St. Paul has decided to proceed with a part of its elaborate electrification project. It will electrify one engine district from Deer Lodge to Three Forks, 113 miles, with sidings and yards. There will be a total of 168 miles of tracks. Direct current will be used with overhead trolley construction.

EL PASO, TEXAS.—Cloudcroft's electric line from mountain resort to Hope and Artesia is again under serious consideration, and a party of Illinois and Kansas City capitalists is expected in Cloudcroft shortly to go over the route of the proposed Cloudcroft-Pecos Valley Electric line. The proposed line will be about 90 miles long.

TACOMA, WASH.—Tacoma citizens rejected an $87,000 bond issue proposed to build a street car line across the tideflats. Regardless of the defeat of the $87,000 bond issue the city council concurred in an ordinance introduced by Commissioner A. U. Mills providing for a fund from which $35,000 in warrants will be issued for the construction of a street railway by the city across Eleventh street bridge to the tideflats.

SAN FRANCISCO, CAL.—City Treasurer McDougald reports that the Crocker National Bank has bought Municipal Railway 5 per cent bonds to the amount of $200,000 and that a purchase of $50,000 has been made by Adams & Company of New York. The supervisors recently authorized the city treasurer to sell these bonds to the amount of $653,000 at a price which would make the net interest 4.90 per cent, thus calling for a small premium. The sales now aggregate $525,000, McDougald says, leaving $128,000 still on hand.

BAKERSFIELD, CAL.—Word comes from San Luis Obispo that W. P. Early of Petaluma and A. D. Bowen, a railway promoter of San Francisco have broached the proposition of an electric line from that city to Bakersfield, and have outlined plans for a survey according to the most feasible routes. A meeting was held at which Mayor McAllister of San Luis Obispo presided and which was attended by a number of prominent business men and capitalists, when the proposition was discussed and was given hearty approval.

SACRAMENTO, CAL.—President Arnstein and Vice-President S. Napthaly of the Oakland, Antioch & Eastern Railroad, were in Sacramento recently on business connected with the construction of the new depot on the present site, which has a frontage of 75 ft. on third street adjoining the Commercial Hotel at Third and I streets. Plans are completed for a 2-story structure which will cover the entire lot, embracing an area of 75x150 ft. The structure will be built of stone and steel. The upper stories will be devoted to company offices.

TACOMA, WASH.—A total of $1,800,000 will be spent by railroads entering Tacoma during 1914 for extensions, improvements and enlargements of terminal facilities. One million dollars of this amount will be spent for the completion of the Port Defiance line, $375,000 for the Oregon-Washington Railway & Navigation Company's viadust across the city waterway, $250,000 for the Northern Pacific viaducts, $125,000 for the Oregon-Washington Railway & Navigation Company's fireproof freight sheds on the Tidelands, $30,000 for the new commercial dock bridge of the Northern Pacific and $20,000 for the Northern Pacific terminal yards.

PORTLAND, ORE.—Judge R. S. Bean in the federal district court, today issued an interlocutory injunction restraining the city council of Portland from enforcing an ordinance recently passed providing for the sale of street car tickets by the local transportation company at the rate of six for 25 cents. The court pointed out the fact that the remedy for the city to pursue would be in the application to the tribunal created by the public utility act enacted by the legislature last winter vesting the railroad commission of Oregon with power to regulate every public utility in the state and further that while the city possessed certain powers, the federal court had power to correct transgressions when the city encroached upon the powers of the state.

SAN FRANCISCO, CAL.—For the purpose of providing funds necessary to change the motive power of the Ocean Shore Railroad from steam to electricity, the general stockholders in that corporation unanimously voted to issue 5 per cent bonds in the sum of $5,000,000. Of the total issue the first $200,000 subscribed will be used for making the contemplated change and equipping for electric service that portion of the railroads operating between San Francisco and Halfmoon Bay. This $200,000 has already been pledged. The remainder is not expected to reach the market for the present. The substitution of electricity for steam will considerably reduce the operating cost of the road, and at the same time will provide more frequent and rapid transportation.

TELEPHONE AND TELEGRAPH.

RIVERSIDE, CAL.—The common council has awarded a telephone franchise to the Pacific Telephone and Telegraph Company for one year, dating from March 1st.

AZUSA, CAL.—Manager F. M. Wright of the Covina Telephone Company states that a number of improvements are to be made in Azusa in connection with their lines, to cost about $4000.

SILVER CITY, N. M.—The Mountain States Telephone Company is considering the installation of a new telephone line to Mogollon and the establishment of a telephone exchange there.

SAN FRANCISCO, CAL.—Judge Seawell has made permanent an injunction issued in 1908, by which the Commercial Pacific Cable Company is restrained from charging a transfer rate on messages filed at San Francisco by the Western Union Telegraph Company for transmission to the Orient. The cable company is restrained from charging such rates at all points where the Western Union is in competition with the Postal Union Company,